Day 10: Practical Social Media Data Mining

ME414: Introduction to Data Science and Big Data Analytics

LSE Methods Summer Programme

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Day 10 Outline

Social Media Data

Accessing social media APIs

"Web scraping"

Social Media Data

Why social media data?

- Volume and coverage
- Twitter: 316 million monthly active users, 500m tweets per day [1]
- Facebook: 968 million daily active users on average for June 2015, 1.49 billion monthly active users as of June 30, 2015 [2]
- Real time — new data is available (somewhat) publicly immediately on current events
- Metadata — geographic location, user device, profile, timestamp and other metadata is accessible.

Appeal of Social Media data

- Good case for machine learning and data mining — lots of data, lots of metadata
- Many-to-many *broadcast* text corpus
- Social network analysis: a graph of social connections

Network data structure of social media

- Broadcast
  - simplex (e.g. radio, semaphore, smoke signal)
  - duplex (e.g. round-table meeting)
- Point-to-point: sender specifies receivers
- Social media allow many of these different forms of communication
- Twitter in particular is a completely new model of communication (social or news?)
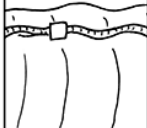- Every user is a sensor, receiver, and broadcaster — a distributed sensor network (Crooks et al 2012)

Possible downsides

- Legal and ethical concerns
  - twitter is public, facebook private – see
    https://twitter.com/tos?lang=en
  - legal issues need to catch up with the technology
  - Are EULAs (End-User License Agreement) too complex to allow 'informed consent'?
- Sampling issues and many new methodological headaches: homographs, people tweet about interesting events
- Biased sample (Barbera and Rivero 2013)
- commercial interfaces are brittle and opaque
- A lot of the content is moronic

Example: Twittdiots

Michael Matthews @YourBuddyBurns

I'm tired of this terrorist bullshit fucking w our country. Fuck it, just nuke Czechoslovakia

Reply Retweet Favorite ••• More

InstrumentalStash @HashHitz

I Can't believe that pair in the Boston bombing was NOT Towel heads!!! They are Czechoslovakian! Daamn!! FUCK Czechoslovakia!

Reply Retweet Favorite ••• More

Kaitlynn Schuler @KaitlynnSchuler

Some Czech mother fucker is about to get LITTTT up. #gethim

Reply Retweet Favorite ••• More

s_elliott11

What did America ever do to the Czech Republic? Where even is the Czech Republic? Have fun with the devil terrorboy

2 days ago Reply Retweet Favorite

Jafar El-Shabazz @llcooljaff

The media fucked up! They was sayin the suspect was a dark skinned male..turned out to be a Czech republican. ??!?!

Reply Retweet Favorite ••• More

Other twitter challenges

- ► Large amounts of data
  - ► storage problems
  - ► analysis problems
- ► Language is informal and often non-textual (emoticons, links, images) - and slang, txtspk, emoticons :-(
- ► lots of fake users
- ► A lot of the content is non-message oriented e.g. `http://twitter.com/search?q=%23JamesCallSam`

Example applications

- Tracking disease through google search terms and social media (Lampos et al 2010)
  - Locate tweets in urban centres
  - Uses a Porter stemmer and stopwords
  - Uses regression to learn which words are associated with flu outbreaks: from 1560 to 97 'markers'
  - Use this association to observe current outbreaks

Example applications

- Predicting election outcomes or polls
- Sentiment: particularly for financial or corporate interests
- (Vasileios Lampos: www.lampos.net)
- Government security/intelligence
- Social network analysis: a graph of social connections
- Nulty et al (2015) study of EP 2014

Social Media Data access

How can we access this data?

- API: Application Programming Interface — a way for two pieces of software to talk to each other
- Twitter, facebook, google — all expose public web services
- Your software can receive (and also send) data automatically through these services
- Data is sent by `http` — the same way your browser does it
- Most services have helping code (known as a wrapper) to construct http requests
- both the wrapper and the service itself are called APIs
- http service also sometimes known as REST (REpresentational State Transfer)

HyperText Transfer Protocol

Anatomy of a http request

```
https://api.twitter.com/1.1/search/tweets.json?
q=Nick+Clegg%21&since_id=24012619984051000&max_id=25012619984051
```

```
Nick Clegg! becomes Nick+Clegg%21
```

- ▶ Parameters to the API are encoded in the URL
- ▶ you must encode requests — spaces and non ASCII characters are replaced

cURL and wget

- It's not usually necessary to construct these kind of requests yourself
- R, Python, and other programming languages have libraries to make it easier
- Usually you will need cURL installed to access an API, wget for downloading a website
- The documentation for the API will describe the parameters that are available.

Available social media APIs

- Wikipedia: mediawiki
- Google
    - google plus
    - blogger
- reddit
- foursqure
- facebook
- twitter: REST, Streaming, firehose, commercial

The twitter APIs: REST

- This is the most comprehensive API
- Returns a sample of historical data from the last 8–10 days.
- Stateless: you send a command and receive a result.
- http GET requests return information
- http POST requests upload or alter information (e.g. twitterbots)
- The manual: https://dev.twitter.com/rest/public
- R package : twitteR

The twitter APIs: Streaming

- Connect to the twitter server and collect tweets as they fly by.
- The manual: `https://dev.twitter.com/streaming/public`
- R package: streamR

Authentication

- Username and Password
- Oauth (ROauth): share a key without sharing a username and password
- IP address limitations
- Rate limitations
- Per-user and per-application

Other options

- ▶ The firehose: work with twitter
- ▶ Commercial options: GNIP (now bought by twitter) and Datasift

The Output: JSON and XML

- XML: eXtensible Markup Language: encodes documents in a form that is both human-readable and machine readable
- JSON : JavaScript Object Notation
- If you have a choice, you probably want JSON
- JSON uses key:value pairs, XML uses trees
- JSON is easily read into a programming language
- Sometimes known as serialization formats

And finally... the data.

- ▶ Full of spam, bots, unicode, and gibberish
- ▶ Homographs and ambiguities are a problem, e.g. Clegg, Cameron, Miliband
- ▶ Lots of retweets (approximately one-third retweets, replies, tweets)
- ▶ Only 1% show location — some methods exist to infer location
- ▶ All aspects of metadata and reply/retweet structure are available
- ▶ All aspects of network structure: followers and 'friends', profile information

Twitterbots

- API also allows actions such as posting tweets (POST)
- Examples:
- @netflix_bot posts new content using netflix api
- @eqbot posts earthquake warnings
- @pentametron posts pairs of tweets in rhyming couplets [3]

Twitterbots

Big Ben
@big_ben_clock

BONG BONG BONG BONG BONG BONG BONG BONG BONG BONG

10:00 AM - 10 Oct 2014

73   ★ 63

Twitter uses: Exploiting the meta-data (non-textual)

- location
- time
- username
- user descriptions
- networks of followers
- retweets of followers and texts

Connecting through R

R packages
- ▶ Twitter: twitteR for REST, streamR for Streaming
- ▶ Facebook: Rfacebook

Python: tweepy and facebook-sdk

other open-source tools exist

Integration with quanteda is fairly straightforward

Other social media access packages

- `tumblR` R interface to the Tumblr web API
- `instaR` R interface to Instagram API
- `Rlinkedin` R interface to LinkedIn API
- `RedditExtractoR` R interface for Reddit API

How to get visible content directly from web pages

Scraping text from the web

- web crawlers/spider download sites by traversing links
- Python - scraPy, Beautiful Soup
- R - Rvest
- Chrome web plugins, import.io
- cUrl, wget, or other tools available ('httrack')
- Problems: rate limiting, ethical issues

Make scraping unnecessary!

- ▶ Organizations and governments should be aware of need for open, machine-readable data
- ▶ data.gov.uk, data.gov
- ▶ Data should be available in human and machine format!
- ▶ Make the raw data available in as many formats as possible.
- ▶ Consider machine readability at time of data collection
- ▶ Provide an Application Programming Interface (API)